CHEST Online Supplement

Development of an Accurate Bedside Swallowing Evaluation Decision Tree Algorithm for Detecting Aspiration in Acute Respiratory Failure Survivors

Marc Moss, MD; S. David White, MA; Heather Warner, PhD; Daniel Dvorkin, PhD; Daniel Fink, MD; Stephanie Gomez-Taborda, BS; Carrie Higgins, BSN; Gintas P. Krisciunas, MPH, MA; Joseph E. Levitt, MD; Jeffrey McKeehan, MS; Edel McNally, MS; Alix Rubio, BS; Rebecca Scheel, MS; Jonathan M. Siner, MD; Rosemary Vojnik, BS; and Susan E. Langmore, PhD

CHEST 2020; 158(5):1923-1933

 DOI: 10.1016/j.chest.2020.07.051

CHEST™ Online Supplement

e-Appendix 1.

Methods:

This study was approved by the Institutional Review Board at each of the four centers (Colorado: #12-0184; Boston University: #H-34068; Stanford: #40831; Yale: #2000020633).

Bedside Evaluation:

Breath sounds and stridor were assessed by auscultating over the thyrocricoid space or listening to the patient's breathing without a stethoscope. If any of these five signs occurred within 10 seconds, the trial of that consistency was recorded as consistent with aspiration. The ten second time period was estimated to be usual duration of time based on the experience of our SLPs. Stethoscopes were used at the discretion of the speech language pathologist.

Flexible endoscopic evaluation of swallow (FEES) examination:

All boluses were dyed green and additional white food coloring was added to thin liquid bolus trials to improve visibility of the bolus. Regarding the food dye, the general guideline was 2-4 drops of green food coloring (depending on bolus volume) for all boluses. White food dye was only used for the thin liquid water boluses in the following manner: 5mL – 4 drops, 15 mL – 8 drops, 2oz – 16 drops, 3oz – 32 drops. After each swallow, the laryngoscope was advanced to closely view the airway before recording the results of that trial. If necessary, patients could drink water between trials to clear any remaining residue. Olympus portable towers with distal chip laryngoscopes (ENF-V3 or ENF-VH) or Kay Pentex systems were utilized. Complete FEES videos with audio were saved to a secure cloud based archive system (VaultStream EasyView) per usual clinical practice.

Across the four sites, there were 21 SLPs that performed at least one study related BSE. Their median experience as an SLP was 9 years, 25-75% quartiles [2.25-18.5] years. All had previous experience caring for ICU patients. A member of the study research team also provided an in person full day BSE study protocol training prior to initiation of the research study at that site.

Results:

We had supplementary oxygen and saturation data on 194 patients (91%). Of these 194 patients, 117 (60%) were on regular nasal cannula, 48 (25%) were on RA, and the remaining 29 patients (15%) were on heated high flow or other oxygen delivery systems. For those patients on nasal cannula the median amount was 3 liter/min (2-5 liters/min].

CHEST™ Online Supplement

e-Table 1: Description of Consistency Testing and Volume

Consistency	Food Item	IDDSI Score	Bolus Size
Ice	Ice Chips	7 transitions to 0	1) ½ teaspoon 2) Full teaspoon
Nectar Thick Liquids	Pre-thickened apple juice	2	1) 5 ml – level teaspoon 2) 15 ml presented in medicine cup 3) 2 ounce via straw, patient controlled (may assist in holding the cup)
Pureed Solids	Applesauce	4	1) 5ml puree – level teaspoon 2) 10 ml puree – heaping teaspoon
Thin Liquids	Water	0	1) 5 ml – level teaspoon 2) 15 ml presented in medicine cup 3) 2 ounce via straw, patient controlled (may assist in holding the cup)
Solids	Graham Cracker	7	1) ¼ piece – instruct to chew before swallowing